

REMARKS

The foregoing amendments to claims 61, 64, and 67 revise all the independent claims so that they now explicitly recite that the contents are sent to the storage system and so that they now make clear that the storage times referred to are backup storage times. Additionally, claims 3-6 have been canceled, and other independent claims have been amended to reflect the “backup storage time” language added to the independent claims. And claim 59 has been additionally revised to correct a typographical error. After those amendments’ entry, claims 2, 10, 11, 13-23, 38, 40, 41, 43-48, 50, 52-53, and 55-69 are pending.

Applicants wish to thank the Examiner for his courtesy in granting the telephone interview that took place on October 3, 2006, between Examiner Le and Applicants’ undersigned attorney. The bases for the September 7, 2006, Office-action rejections were discussed in the course of that interview. In particular, Applicants’ attorney indicated that the criterion by which the claims’ “storage times” are determined is not crucial to the invention’s broader aspects; that phrase is intended to refer to any sequence of times up to which respective backup operations bring the backup storage system up to date. Therefore, that phrase, while broad, is not vague. The Examiner replied, though, that the claims would be clearer if the claims recited those storage times as “backup storage times,” presumably to distinguish them from the times at which source-file storage occurs.

Applicants have therefore revised the claims to make that change. This change, together with the content transmission’s explicit recitation, remove the bases for the § 112

rejections. Applicants additionally believe that the prior-art rejections made in the last Office action were based on the breadth that the Examiner attributed to the claims without the “backup storage times” language and that the addition of this language should eliminate the bases for those rejections, too. However, Applicants repeat below a previously submitted explanation of the distinctions between the claimed subject matter and prior art, and they address specific additional points that the Examiner raised.

As was explained in a previous response, the invention is directed to an advance in backup-location maintenance of backup information from which source data can be restored at a source location. U.S. Patent No. 6,460,055 to Midgley et al. describes an advantageous approach to this task. Specifically, the prior-art Midgley et al. system monitors writes to the source-data device and sends the remote location a journal that identifies those locations and the values written to them.

The approach described in the instant application’s specification reduces the bandwidth that transmitting such backup information requires. As the prior-art Midgley et al. arrangement does, the embodiments referred to in the instant application’s ¶0046 (renumbered ¶0049 in the publication)—i.e., “the embodiments in which the detecting agent includes a file system filter”—identify the locations to which data have been written, and they do so *dynamically*, i.e., as that paragraph defines it, “substantially contemporaneously with the changes to the policy data files.” Unlike that prior-art arrangement, though, those instant-application embodiments are not described as sending the backup location any *content* (as opposed to addresses) recorded by that monitoring. Instead, as application ¶0048 (publication ¶0051) says, “At storage time, . . . the contents of the changed locations

detected by the detecting agent 465 can be copied from the policy data files 475 stored on the data storage device 470 to the delta file 590 stored on the backup storage device 570.”

That is, although the changed locations are identified whenever writes to them occur, the contents to be sent in response to such identification are obtained at backup storage time. This results in the backup location’s receiving the contents of each location whose contents differ from what they were at the last backup, but it does not result in transmission of intermediate values; a location whose contents changed more than once since the last backup has only its last value sent. So the claimed invention enables a backup system to reduce the bandwidth that transmitting the backup data requires.

Applicants’ specification is not the first to disclose keeping transmission bandwidth that low, but their way of doing so is more efficient than the ways described in the prior art of record. One of those ways is the approach that U.S. Patent No. 5,999,947 to Zollinger et al. exemplifies. Zollinger et al. implement their Fig. 1’s remote clients 48 in remote terminals, such as laptops, whose connections to a server 68 are only intermittent. The server maintains a table 20 of which each remote terminal maintains a copy that gets updated when that terminal connects to the server. Specifically, a differencing engine 30 generates and sends to the remote terminal a list 38 of the changes by which given versions can be updated to later versions. It arrives at the change list by making version comparisons, so it sends no intermediate values. However, although the Zollinger et al. approach thus saves channel bandwidth, the processor time required to do so can be prodigious; Zollinger et al. have to compare complete versions of all the data being backed up.

The prior-art Midgley et al. patent describes an approach that is less computation-intensive than Zollinger et al.'s but that still does not exhibit the efficiency that the present invention enables a backup system to provide. As is explained in the passage that begins in line 66 of Midgley et al.'s column 21 and extends through line 22 of its column 22, Midgley et al.'s prior-art system includes a coalescence operation. That operation can be used to cull duplicates from the journal that results from monitoring writes to the disk. Specifically, that operation identifies the locations that the journal lists more than once, and, for such locations, the system dispenses with sending any journaled contents but the last.

In contrast, although embodiments of Applicants' invention may use coalescence for other purposes, a system that embodies the invention does not require coalescence in order to keep transmission bandwidth low. This is because at storage time it merely obtains from, say, the source files themselves the contents of those locations that the journal has identified as written to, and it sends only changed contents thus obtained. So Applicants' invention enables the backup system to achieve low transmission bandwidth more efficiently than the prior art does.

In the most recent Office action, however, the Examiner contends that the claims directed to this advance read on the prior art of record. As was stated above, that position may have arisen simply from the Examiner's having attributed an unintended breadth to the claims. If so, the new language making explicit that the storage times are backup storage times may suffice to make apparent to the Examiner without further discussion the distinctions between the prior art and the claimed subject matter. In case this is not so, though, Applicants request that the Examiner reconsider the Office action's ¶5 statement

that the “dynamically identifying locations . . . previous storage time” language in Applicants’ claims reads on the periodic update creation that the Examiner understands Zollinger et al.’s Fig. 6 to depict.

Of particular relevance to this issue is Applicants definition of *dynamic* in their application’s ¶0046 (publication ¶0049). That paragraph deals with what Applicants refer to as a “system-filter” approach to change detection, i.e., with an approach in which operating-system-to-storage-device communications that request changes in the policy data files are intercepted in order to detect changes. That paragraph defines *dynamic* to mean occurring, as such interceptions do, “substantially contemporaneously with the changes to the policy data files.”

Applicants’ specification contrasts this dynamic approach with what they refer to as a “scanning-agent” approach, to which Zollinger et al.’s detection approach is most similar. Applicants’ application ¶0047 (publication ¶0050) describes this file-scanning approach as detecting changes by comparing (in Applicants’ case, summaries of) baseline images of the files to be backed up with (again, summaries of) second images. And the passage at lines 55 et seq. of Zollinger et al.’s column 6 indicates that their approach is similar. Specifically, that passage says that their system compares the current contents with reference contents that have been stored to provide a basis for comparison. As the paragraph bridging Zollinger et al.’s columns 9 and 10 states, Zollinger et al.’s updates are generated either periodically or in response to the occurrence of some specified number of changes to the database being backed up. Zollinger et al.’s Figs 3A and 3B illustrate these updates as lists of file/location designators together with the thereby-designated locations’ new contents.

And it is these updates that the routine of Fig. 6 processes; i.e., contrary to the understanding expressed in the Examiner's ¶5, that routine involves no dynamic detection, so none of the independent claims, which recite that feature, read on that routine.

Applicants additionally ask that the Examiner reconsider the rejections based on U.S. Patent No. 6,460,055 to Midgley et al. In particular, Applicants request that the Examiner reconsider his ¶6 statement that the claims read on this prior-art Midgley et al. arrangement. All the independent claims require that what gets sent to the backup system in response to dynamic detection of a change at location is what the thereby-identified locations contain "at that backup time." In contrast, the contents that the prior-art Midgley et al. arrangement sends the back-up system are those that were read during the change-detection operation. The result, unless some additional, coalescence operation is performed, is a greater transmission-bandwidth requirement than the claimed subject matter imposes.

Consequently, the independent claims all define patentable subject matter, as do the dependent claims, at least by virtue of their dependence on the independent claims. Applicants therefore request that all claims remaining in the application be allowed.

Respectfully submitted,

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